LEARNERS' PERCEPTIONS ABOUT THE INTEGRATION OF THEIR SOCIO-CULTURAL BELIEFS IN LIFE SCIENCES

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ABSTRACT – Culturally responsive science teaching and learning has been a subject of intense discussion among researchers on pedagogy the world over. This study explores learner perceptions about the inclusion of their socio-cultural beliefs in the teaching and learning of particular Life Sciences topics. It presupposes that the integration of learners' socio-cultural beliefs in certain Life Sciences concepts is likely to motivate learners to engage fully in the learning process as they find relevance of what they learn in their lives. The study employed both quantitative and qualitative research designs. A questionnaire comprising closed and open questions was administered to 166 Grade 10 and 11 Life Sciences learners in seven high schools in Johannesburg. The learners belonged to diverse religious affiliations and races, which provided a rich ground for diversity in learner perceptions. The majority of learners perceived the incorporation of cultural beliefs in learning particular Life Sciences topics as important. The findings however indicate that learners were conflicted when the integration concerns topics embedded with socio-scientific issues such as reproduction, genetically modified foods, cloning, organ transplants and donation. Some learners did not perceive the integration as worthwhile since their goal for learning Life Sciences was to acquire scientific knowledge. It can be concluded and recommended that teacher professional development should continue to equip Life Sciences teachers with skills to deal with such diverse learner perceptions in the classrooms.

Keywords: Socio-cultural beliefs, learners' perceptions, Life Sciences.

INTRODUCTION

Contextually appropriate science education has been advocated for many decades. By relating the content to be learned in the science classroom with the learning experienced in learners' cultures, has been regarded as the most effective way to contextualise the teaching of science (Reyhner, Gilbert & Lockard, 2011). Incorporation of learners' socio-cultural beliefs in Life Sciences teaching and learning helps to affirm learners' identity as members of the learning community. Due to urbanisation, foreign value systems may threaten, modify, enhance, replace or corrupt the cherished value system of an indigenous group of people. As such, it is critical to involve learners in making decisions on the *what, how and why* of their socio-cultural beliefs that should be integrated in science teaching and learning. Consequently, the purpose of this study was to determine learners' perceptions on the inclusion by educators of learner socio-cultural beliefs in some Life Sciences topics during the learning milieu. Socio-cultural beliefs refer to a set of common norms and values a certain group of people uphold in their day to day living.

THEORETICAL BACKGROUND

The study uses the framework on cultural influences in education as adapted from the Hawaai theoretical model (Ledward & Takayama, 2008). Figure 1 shows the model.

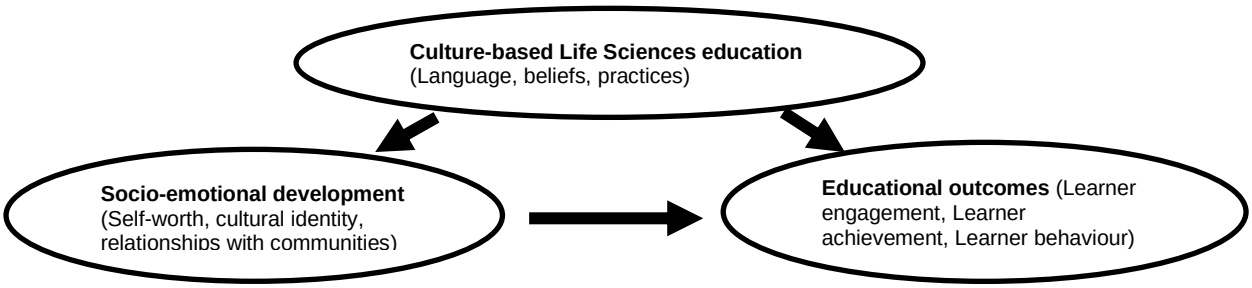

Figure 1: Cultural Influences in Life Sciences teaching and learning (Adapted from Ledward & Takayama, 2008)

The framework explains the interrelationships that exist between different knowledge domains, how they influence learner engagement and ultimately determine learner performance and achievement in Life Sciences. The study assumes that the beliefs learners hold about a particular Life Sciences concept or process are the lens learners use to determine how worthy they are in the classroom. This style by the learners will in turn impact immensely on how they participate, accept and understand what they learn.

In the Life Sciences curriculum document, the Department of Basic Education (2011) defines Indigenous Knowledge Systems (IKS) as 'a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years' (p. 5). The learners' socio-cultural beliefs herein referred to in the current study falls in the IKS domain. The current study premises on the fact that when learners' socio-cultural backgrounds are integrated in the Life Sciences classroom, it is likely to positively influence learners' socio- emotional development and academic outcomes. Learners fail to decipher meaning from classroom learning activities, whose content is divorced from their culture. Demmert (1999) describes such classroom environments as providing decontextualized and one-size-fits all science material. There is limited research that has investigated how learners interpret and perceive the relationship between indigenous knowledge and western science (Gondwe et al. 2014). Consequently, the current study intends to answer the research question: How do learners perceive the integration of their socio-cultural beliefs in some Life Sciences topics during the teaching and learning process?

METHODOLOGY

The study employed both quantitative and qualitative research designs (Creswell, 2014). This is appropriate as the combination of the dual strengths of both quantitative and qualitative research methods compensate for the individual limitations of the respective designs. (Pluye & Hong, 2014). Using Patton's (2002) notion of selecting appropriate sample for a study, seven different high schools in Johannesburg were randomly selected. All Grade 10 and 11 Life Sciences learners from the schools (n=166) participated in the study. Table 1 shows learner profiles.

Table 1: Learner profiles

Gender	Females		Males	
	102		64	
Race	Black	White	Indian	Coloured
	117	10	18	21
Religion	Christianity	Hindu	Muslim	African tradition
	105	8	17	36
			Total no. of learners	**166**

Data collection involved the administration of a questionnaire which sought both learner understandings of the role played by the inclusion of their socio-cultural beliefs in the teaching and learning of Life Sciences topics and how this influenced the learners' understanding of the concepts. The questionnaire comprised two sections, the quantitative section and the qualitative section. The quantitative section with Likert scale (agree, neutral and disagree) required learners to indicate how they perceive biological practices such as abortion, cloning and organ transplantation in relation to their socio-cultural beliefs in order to answer the research question: How do learners perceive the integration of their socio-cultural beliefs in some Life Sciences topics during the teaching and learning process? Example of a statement learners needed to respond to was: Relating content on abortion to my cultural practices and beliefs helps me in applying the content. The above Life Sciences topics were selected because they are considered to be contentious as they invoke learners' belief systems. The qualitative section provided learners with an opportunity to explain and elaborate on their perceptions in order to determine how those perceptions are informed by their socio-cultural beliefs. For reliability purposes, the questionnaire was first piloted to a group of 20 MEd Science students and 20 Third Year Life Sciences Methodology students. Certain questions were removed and others were modified based on the responses from the analysis of pilot data. Quantitative data was analysed using SPSS version 25 and qualitative data was subjected to content analysis with the aid of Computer

Assisted Qualitative Data Analysis Software (CAQDAS) like atlas ti. 8. Due to the scope of the paper, only findings of learners' perceptions on the integration of their socio-cultural beliefs in the teaching of some Life Sciences topics are presented.

RESULTS

Analysis of data from quantitative and qualitative responses from 166 learners shows that the majority of learners perceive the incorporation of cultural beliefs when learning particular Life Sciences topics as important. The findings however indicate how learners were conflicted when the topics to be integrated with their socio-cultural beliefs, are embedded with socio-scientific issues. Examples of such topics were reproduction, genetically modified foods, cloning and organ transplants and donation. Socio-scientific Issues (SSIs) are controversial, socially relevant and real-world problems that are informed by science and often include an ethical component (Zeidler & Nichols, 2004). This calls for appropriate teacher pedagogical practices when teaching such topics. Table 2 and 3 show the distribution of learners' perceptions regarding the different Life Sciences concepts in which their beliefs could be integrated.

Learners' perceptions about topics where incorporation of cultural beliefs can be done

Learners had various perceptions regarding the topics which teachers could use in incorporating their cultural beliefs as shown.

Table 2: Learners' perceptions about topics where incorporation of cultural beliefs can be done

	Distribution of learners (%)		
	Agreed	**Neutral**	**Disagree**
Life Sciences topics			
1.Disease and issues of traditional medicine	63.5	27.7	9
2.Human impact on environment and conservation	55.4	30.7	13.9
3.Biotechnology: GMOs and cloning	44	28.3	27.7
4.Circulatory system: Blood transfusion	54.2	36.7	9
5.Excretory system: Organ transplant/donation	49.4	39.8	10.8
Average	**55.2**	**32.6**	**14**

From the findings in Table 2, it shows that the majority of learners (63,5%) agreed that their socio-cultural beliefs should be integrated in the teaching and learning of diseases and issues of traditional medicine. This is consistent with previous studies which showed that in Africa, 80% of the population uses traditional medicine (Geneva, World Health Organisation, 2001), Further, similar studies have found that the use of traditional medicine remains popular in most regions of the developing world even amongst people with access to modern health facilities (Gari, Tarlagadda & Wolde-Mariam, 2015). Another important reason for such high preference of traditional medicine lies in the belief that such medication can treat illness from both mystical and natural causes (Bishaw, 1991). In their responses to open-ended questions, learners demonstrated how their belief systems influence the way they perceive Life Sciences teaching and learning practices in their classrooms.

Learners' reasons for their perceptions

A good number of learners (49.4%) who agreed to the incorporation of their cultural beliefs in specific Life Sciences topics such as organ transplant/donation, indicated in the open-ended questions why such integration was important to them. When responding to issues about the excretory system and associated concepts such as kidney diseases and transplant, some of the learners expressed the belief that diseases of the kidneys are caused by witchcraft. An example of one learner's response was, "People bewitch innocent others, for example the kidney stones, how can one grow stones in the body? Obviously witches planted the stones in the body". Such a response shows how learners are ingrained in their belief systems, which can interfere with their understanding of scientific concepts if such misconceptions are not appropriately dealt with during the teaching and learning process. In this case, there is a likelihood of learners always finding an easy way to explain phenomena by blaming it on witchcraft instead of exploring the logical scientific reasoning.

Learners had diverse perceptions regarding the practice of organ transplant. Some learners indicated that the process can help in prolonging the lives of people especially if it is the last resort

as saving life is more important than considering one's beliefs. On the other hand, there were learners with strong religious beliefs, who viewed it as a practice of interfering with the natural process of creation. When referring to the process of dialysis, learners wrote,

Learner 1: What it means is if God wants a person to die, the person must accept fate and not survive under machines.

Learner 2: "You will die when you are meant to die and if your kidneys fail it is a sign.

There were learners whose responses had an ethical angle as they pointed out that death is unconceivable to humans hence it could be possible that when an organ is harvested from a dead person, his/her 'soul' might feel pain. Others pointed out that there is need to respect the dead by burying them when their bodies are intact. Learners who held strong traditional African beliefs, felt that it was not acceptable to implant an organ from one person to another particularly amongst people who are not of the same family. One learner responded, "You cannot mix blood". These learners revealed their beliefs by arguing that an incomplete person (referring to the organ donor) could not be accepted by the 'gods' after death, so the person's spirit would roam around on earth. Another argument why some learners' cultures forbid transplants was that both the donor and the recipient would not be recognised by their ancestors which would lead to them not being at rest after death. These learners believed in the supernatural powers as explained by Wallace (2015) who contends that one central belief of the African worldview is based on the continuous role by ancestors in protecting, guiding and admonishing both the living and the dead.

Cloning proved to be a contentious concept in Life Sciences as it invoked the learners' belief systems. Indeed, some learners condemned the cloning of organisms indicating that species should be brought to earth naturally. These learners' reasons were that God gives life and therefore cloning shows defiance against the special creation, which should be the preserve of God alone. As such, only 44% of the learners agreed to have their belief systems incorporated when learning the topic cloning, which is against 28.3% who were neutral and 27.7% who did not agree. Generally, most learners from Christian and Muslim religions expressed their belief in God.

The extent of some of these learners' faith in their religion is portrayed in some of the examples they wrote. For instance, one learner pointed out that any illness or any disease infection happens because God has allowed it. They indicated that only prayer could heal the sick or cure diseases no matter what type of diet one follows. There were learners who even mentioned that they lost their loved ones who did not seek any medical help because their religion does not encourage clinical treatment. Based on these findings, Life Sciences teachers need to utilise teaching strategies which help to deal with such beliefs without necessarily undermining them. By ignoring such beliefs, acquisition of concepts such as disease causing microorganisms covered in Grade 11 and the issue of immunity that is handled in Grade 10 would be compromised. The role of the teachers is to employ pedagogical strategies which enable learners to realise the conflict between their beliefs and the scientific concepts then assist learners to correctly decipher the best explanation of the phenomena. Table 3 shows learners' perceptions about the integration of their socio-cultural beliefs and various concepts under the topic reproduction.

Learners' perceptions about integrating socio-cultural beliefs and reproduction

Learners showed different perceptions regarding the suitability of certain concepts on reproduction for integration with their socio-cultural beliefs during the teaching and learning process.

Table 3: Distribution of learners' perceptions about the integration of socio-cultural beliefs and reproduction

	Distribution of learners (%)		
	Agree	Neutral	Disagree
Concepts on reproduction			
Menstrual cycle	54.8	41.6	3.6
Abortion	41	35.5	23.5
Contraceptives	48.8	38	13.3
Circumcision	57.8	35.5	6.6
Average	**50.6**	**37.7**	**11.7**

The topic reproduction proved to evoke emotions in most learners when it came to its integration with their socio-cultural beliefs. An average of learners who agreed to the integration of their beliefs in the teaching and learning of reproduction (50.6%) is lower compared to the average of 55.2% in Table 2 where learners agreed to the integration of their beliefs with other topics. Abortion had the lowest percentage of learners who agreed (41%) and had the highest percentage of learners (23.5%) who disagreed to integrate the topic with their socio-cultural beliefs, which is double the average under that category (11.7%). In response to the open-ended question which required them to explain how they perceived the different processes they study in Life Sciences, some of the learners regarded abortion as murder, and therefore a sin. For instance, some of the learners indicated the following:

Learner 1: Abortion is a sin because you are killing an innocent child.
Learner 2: Abortion is wrong because killing is against the universal rights, everyone has a right to life no matter the circumstances.

There were other learners who, despite their beliefs, complimented the government for 'decriminalising abortion'. These learners' sentiments are supported by Jewkes and Rees (2005) study where they found a decline in abortion-related deaths (91%) since 1994. These learners were focusing on the reality of the life they live as teenagers. As such, their responses were emotive and empathetic to their peers who fall pregnant. Some of the reasons given were that abortion is necessary to pregnant teenagers; it is inevitable as it would enable the girls to continue with their studies; that such teenage girls would not be ready to be parents; and that the girls should not be held accountable because the circumstances that caused them to be pregnant could be beyond their control. One learner responded, "what if the girl was raped or has no access to contraceptives?" This is a very pertinent question in a society where parents are not comfortable to discuss issues of sexuality with their children. This has pedagogical implications on Life Sciences teachers to assume new roles because Irvine (2003) suggested that successful teachers of culturally diverse learners should adopt parental/surrogate roles with their learners in order to build cultural competence.

In as much as an average 55.2% (Table 2) and 50.6% (Table 3) of the learners agreed that certain topics require integration with socio-cultural beliefs, there were some who were neutral (32.6% and 37.7% and those who disagreed (14% and 11.7%) in Table 2 and 3 respectively. The main reason given by those who disagreed was that Life Sciences, like any other science is a concise and empirical truth. Examples of what some of the learners wrote was, "We need not pollute science with culture or opinions; Integration merely hinders progress". Such learner perceptions defy the principles underpinning the nature of science and these learners may fail to conceptualise Life Sciences concepts appropriately. Therefore, teachers should employ pedagogical activities such case studies, that engage learners in application of what they learn in everyday life. In this way, learners may appreciate the relationship between science concepts and their belief systems.

DISCUSSION OF RESULTS

The findings show that learners appreciate and value the importance of integrating their socio-cultural beliefs in the Life Sciences classroom, particularly when dealing with topics embedded with different socio-scientific issues that directly affect the learners. Baker and Taylor (1995) posit that learners can make the best out of their worldviews in learning scientific concepts provided teachers utilise constructivist teaching strategies that recognise the important role of learners' prior knowledge. As early as 1982, Gilbert, Watts and Osborne noted that learners' prior

understandings influence their interpretation of new learned information. As such, the findings of the current study showed how learners because of their strong beliefs failed to accept organ transplants, and how the topic reproduction (e.g. abortion and contraception) and cloning evoked emotions in most learners. These learners did not give room for proper conception of new scientific concepts because of what they already knew based on the belief systems. This is because beliefs are enduring since they cannot be easily changed, hence Pajares (1992) described them as deeply personal, rather than universal, and unaffected by persuasion. Though Pajares was referring to teachers' beliefs, this also applies to learners' beliefs. It there calls for Life Sciences teachers to apply pedagogical strategies that engage learners in a process of reflection. Previous researchers (e.g. Driver, Newton & Osborne, 2000) advocated for the use of argumentation, discourse and case studies to enable the learners seek evidence, engage in critical thinking and make informed decisions when dealing with diverse socio-scientific issues. Because the Life Sciences concepts dealt with in this study evoked emotions amongst learners from varied belief systems, argumentation would provide an opportunity for learners to explore divergent ways of viewing a phenomenon in order to reach a consensus. When learners are involved in dialogue, they gain scientific literacy through the debating on issues and sharing of their multiple views based on competing and conflicting evidence (Zeidler, Walker, Ackett & Simmons, 2002). In this way, explicit connections between learners' beliefs and the nature of science are likely to be revealed to and conceptualised by learners (Zeidler, et al., 2002).

CONCLUSION

There were three main findings from this study which answered the research question: How do learners perceive the integration of their socio-cultural beliefs in some Life Sciences topics during the teaching and learning process? Firstly, the majority of learners perceived the incorporation of cultural beliefs when learning particular Life Sciences topics as important. Secondly, the findings indicate that learners were conflicted when the topics to be integrated with their socio-cultural beliefs, are embedded with socio-scientific issues. Examples of such topics were reproduction, genetically modified foods, cloning and organ transplants and donation. Thirdly, some learners did not perceive the integration as worthwhile since their goal for learning Life Sciences was to acquire scientific knowledge. Based on the theoretical framework used in the study (Fig.1), indeed the findings show the relationship between learners' belief systems and Life Sciences concepts. The diverse views learners brought up, for example, in relation to the incorporation of their socio-cultural beliefs in such concepts like abortion, cloning and organ transplant should inform teachers' pedagogical practices. Because some learners were explicit in expressing how abortion for instance, conflicts with their beliefs, it is imperative that teachers employ strategies and assign activities that engage learners fully in discussion to develop critical thinking skills. The study suggests argumentation and case studies as platforms through which learners can explore their different viewpoints and then make informed decisions regarding such contentious science phenomena.

The study has methodological limitations in that classroom observations of the actual teaching and learning process were not done, which could have yielded important information on learner engagement. Moving forward, the researcher recommends classroom observations and interviews for both teachers and learners for future studies. Ultimately, the findings reiterate the need for a continued teacher professional development that focuses on integrating learners' socio-cultural beliefs and practices in the teaching of particular Life Sciences concepts in order to make science interesting and relevant to the learners' lives.

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